Laboratory 7
Using the UART, SPI, I2C, TMP3 Temperature Module and an LCD Display

Due Date: _____ Name:_____

Name:_____

Points: 0 Points

You may work individually, or in pairs and submit a joint report.

Objective: The purpose of this laboratory is to develop a control system for a power generation system using a PIC32MX microcontroller with: an LCD Display, a temperature PMOD module, an 8 LED PMOD module, and a terminal connected to the MX-7 using a UART. The LCD display, terminal video display and LEDs will provide visual information to the operator. You will be using c function libraries that are included using the *#include <plib.h>* command in your c source file. The c library reference manuals are posted on UNM Learn. SPI sample codes are posted on Learn.

Activities: For this assignment, the power output level of the system will be selected using the 3 push button switches on the MX-7 board. The power level will be indicated on the 8-LED module. For the power output indication, the number of LEDs that are lit will correspond to the selected power level; a 1 input level will be indicated with one lit LED and for power level seven, which corresponds to all three buttons being pressed simultaneously, seven LEDs will be lit on the LED module. In addition, a message will be displayed on the LCD module which says: POWER LEVEL: x, where the value of x ranges from 0 to 7.

The ambient temperature will be measured using the TMP3 module. The ambient temperature will be transmitted via the UART to the terminal display. *Hint: a CR character moves the cursor to the start of the line, and an old value can be overwritten with an updated value. Also, remember that the terminal will be expecting ASCII characters.*

You will display the temperature in degrees Fahrenheit. (The module outputs temperature in degrees Celsius.) Typical room temperature is about 73ºF. When the temperature reaches 80ºF, you will display a flashing message on the LCD Display that says: “Overheated!”. (You can cause the temperature to reach this temperature by placing your finger on the temperature sensing integrated circuit on the TMP3 module.) You will also transmit a message to the terminal that records the overheating followed by a LF and CR, so that the message is not overwritten. The over temperature condition will also force the output LEDs to turn off, even if the buttons are pressed.

When the temperature measured by the TMP3 module returns to a normal room temperature, the system will return back to the normal operation mode.

Notes: The LCD display and breadboard modules are connected to the Chipkit board using standard pmod cables. The RS-232 module is connected to the board using a UART crossover cable. Verify that the Chipkit board jumpers are configured properly, to ensure that the pmod boards are powered. You can test the wiring and terminal configurations using the sample codes.

Documentation: Your lab activities must be documented following the guidelines that are provided on the course UNM Learn site. You must also demonstrate that your project functions properly to one of our TAs; who will then sign your copy of this assignment sheet.

Reference Information:

- Cerebott MX4cK™ Board Reference Manual
- PIC32MX3XX/4XX Data Sheet
- PIC32 Peripheral Libraries for MPLAB C32 Compiler
- PmodCLS Serial LCD Display Module Reference Manual
- PmodTMP3 Temperature Sensor Reference Manual
- Pmod8ld Eight LED Module Reference Manual
- PIC32 Reference Manual UART
- PIC32 Reference Manual Serial Peripheral Interface
- PIC32 Reference Manual I2C Interface

Suggestion: Keep all of your files on a USB memory device as there is no guarantee that any information you store on lab machines will be preserved. On occasion, the machines must cleaned and reloaded, so any information stored on them will be lost.